Materials Engineering Branch

TIP*

No. 023 Protective Conductive Coatings for Magnesium

Author(s): A. J. Babecki and Ernest Mielke Contact: (301) 286-6882

Although most of the more common magnesium alloys are not approved for general space flight use because of their susceptibility to stress corrosion cracking (SCC), their use is allowed for some non-safety critical applications. As these alloys are quite reactive and corrode easily, they must be protected by means of coatings. However, the application of a protective coating on an alloy that is otherwise susceptible to SCC does not improve that alloy's resistance to SCC. It merely helps to delay the SCC.

There are many plastic and paint films that may be used to provide protection against general corrosion. These, of course, are dielectrics. When an electrically conductive coating is required on the magnesium for ground purposes, a metallic coating is usually applied. It should be remembered that most other common metals are cathodic to the magnesium, so that the corrosion of the magnesium will be accelerated at pores or scratches or other areas where the surface layer of the protective metal is penetrated by the electrolyte, which may be atmospheric moisture. Therefore, layers of electroless nickel, electrolytic nickel, copper, tin, etc. should be at least 0.001 inch thick before any gold flash is applied.

One of the popular protective electrically conductive coatings on magnesium is a thin film of tin. A thin tin coating is deposited on the magnesium surface using Dow 23 or a stannate immersion process. The part to be coated is immersed in an alkaline solution of sodium tin. A number of commercial sources offer this finish. Before selecting a specific vendor, the conductive properties of the film should be verified by performing conductivity measurements on sample parts.

NASA-STD-6004 titled “Guidelines for the Selection of Metallic Materials for Stress Corrosion Cracking Resistance in Sodium Chloride Environments” should be consulted to determine an alloy’s susceptibility to SCC.